U. S. NUCLEAR REGULATORY COMMISSION

INSPECTION REPORT

FACILITY DOCKET NO.: 50-443

INSPECTION REPORT NO.: 50-443/90-84

FACILITY LICENSE NO.: NPF-86

LICENSEE: Public Service Company of New Hampshire
P.O. Box 300
Seabrook, New Hampshire 03874

FACILITY: Seabrook

INSPECTION DATES: September 17 - 21, 1990

INSPECTION TEAM:
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M. McWilliams, Human Factors Specialist, SAIC

SUBMITTED BY: _____ 12/5/90
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APPROVED BY: _____ 12/10/90
for Peter W. Eselgroth, Chief Date
PWR Section, Operations Branch
Division of Reactor Safety

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## DETAILS

### 1.0 EXECUTIVE SUMMARY

A special, announced team inspection was conducted of the Seabrook Plant emergency procedures. The purpose of the inspection was to determine if the emergency procedures used at the Seabrook Plant were technically correct; if their specified actions could be physically accomplished using the existing equipment, controls and instrumentation; and, if the available procedures had the usability necessary to provide the operators with an effective operating tool. For this inspection, the term emergency procedures included the EOPs, AOPs, and all procedures referenced directly within the EOPs and AOPs. The inspection consisted of reviewing facility documents and procedures; performing procedure walkdowns, both in the control room and in the plant; and interviewing facility personnel.

The overall assessment of the Seabrook Plant emergency procedures, in place at the time of the inspection, is that the program for generation and maintenance of the procedures is very good. It should be noted that all EOPs had been reviewed and revised accordingly, just prior to this inspection. The inspection team determined that EOP readibility and usability for those recently revised had improved over those procedures previously in place.

### 2.0 BASIC COMPARISON OF OWNERS GROUP ERGs WITH FACILITY EOPs

#### 2.1 PURPOSE:

To ensure that the licensee had developed sufficient procedures in the appropriate areas to cover the broad spectrum of accidents and equipment failures.

#### 2.2 SCOPE:

The inspection team compared the Westinghouse Owner's Group (WOG) list of Emergency Response Guidelines (ERGs), Revision 1 of the High Pressure Version, to the Seabrook EOPs that are now in effect. Additionally, the team reviewed the findings of the NRC staff and Atomic Safety and Licensing Board. The comparisons were performed to ensure that the licensee developed procedures in accordance with the WOG recommendations or adequate justification was provided to substantiate why the guidelines were not followed.

#### 2.3 FINDINGS:

Seabrook had originally proposed to implement EOPs conforming to the WOG ERGs. These were reviewed by the NRC staff and found inadequate, as documented in NUREG-0896, "Safety Evaluation Report related to the operation of Seabrook Station, Units 1 and 2," Supplement 6.

At that time, the NRC staff found that the Critical Safety Functions as defined in the ERGs did not meet the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," Supplement 1. These requirements were reinforced by order of the Atomic Safety and Licensing Board (ASLB) in their Partial Initial Decision of March 25, 1987 (LBP-87-10, 25 NRC 177, 198, 200). Subsequently, the licensee developed two additional Critical Safety Functions, "Emergency Recirculation" and "Radiation Monitoring System" to satisfy the concerns of the ASLB.

Additionally, it was noted that the licensee has opted to use the two-column format not only for the EOPs, but also for other abnormal/emergency procedures not specifically addressed in the WOG ERGs.

2.4 CONCLUSION:

The Team concluded that the licensee had developed and implemented appropriate procedures for addressing a broad spectrum of accidents at Seabrook. The team also concluded that the licensee decision to use the two column format when developing these procedures (emergency and abnormal) would improve readability and usability during an event.

No violations or deviations were identified with respect to this functional area.

3.0 INDEPENDENT TECHNICAL ADEQUACY REVIEW OF THE EMERGENCY PROCEDURES

3.1 PURPOSE:

Review the emergency procedures to assure that procedures are technically adequate and accurately incorporate the guidelines of the ERGs.

3.2 SCOPE:

The scope of the review included the procedures listed in Attachment 1. The EOPs were reviewed to verify that appropriate priority of accident mitigation strategy is incorporated, as directed by the ERGs.

3.3 FINDINGS:

A. PRIORITY OF ACCIDENT MITIGATION STRATEGY

The recommended step sequence in the ERGs is closely followed in the EOPs. The Team found no major deficiencies in accident mitigation strategy. Entry and exit points are generally well defined and appropriate.

B. DEVIATIONS BETWEEN EOPs AND ERGs

The EOPs closely follow the guidance provided in the ERG's. Deviations, warranted by plant specific design, are incorporated into the EOPs.

One discrepancy noted was that E-2, step 5, RNO states "Establish make-up to the CST." The deviation document states that plant specific means have been added to supply make-up water to the Condensate Storage Tank (CST), but the procedure does not list such plant specific means.

Another discrepancy noted was that the deviation document for ES-0.2, Caution Step 6, states that there is no backup for refill of the CST from which the Emergency Feedwater pumps takes a suction. However, during the walkdown of Attachment C to FR-H.1, the auxiliary operator demonstrated the contents of the CST emergency makeup box for introducing fire water to the Emergency Feedwater pumps.

Other examples of procedure and step deviation documentation enhancement that may be helpful to operators are listed in Attachment A.

The licensee agreed to review and ensure that adequate and accurate justification is provided for all deviations.

C. SAFETY SIGNIFICANCE OF DEVIATIONS

The Team found no instance of failure to perform a required safety evaluation.

D. DEVIATIONS WARRANTED BY PLANT SPECIFIC DESIGN

The Team found that deviations warranted by plant specific design are adequately incorporated in the EOPs.

E. SETPOINT DOCUMENTATION

Several plant specific setpoints were selected from the EOPs and compared to the setpoint documentation. Setpoints selected from the EOPs matched the setpoint documentation. The documentation is adequately controlled. Adverse containment values are provided when required.

F. DECISION POINTS

Decision points in the EOPs are generally well defined. Senior reactor operator licensed personnel demonstrated a good understanding and ability to discriminate among decision points. However, some weaknesses do exist in the EOPs. For example, in three instances, ES-0.1, step 4 RNO; ES-0.2, step 3; and ES-0.2, step 16; the phrase "as necessary" was noted in the procedures. Operators stated that the phrase itself was not helpful and could be deleted. The licensee agreed to review the use of such vague terms in the procedures.

G. HUMAN FACTORS OVERVIEW

The EOPs were reviewed for consistency with guidance provided in the Seabrook EOP Writer's Guide (OP 9.1) and human factors principals as described in NUREGs 0899 and 1358. Although some discrepancies were noted, none were determined to pose significant safety concerns. Types of human factors deficiencies that were noted across multiple procedures are indicated below. Specific examples are included as comments in Attachment 2.

- Inconsistent highlighting of logic terms AND/OR and inappropriate highlighting of words AND/OR/THEN when not used in conditional statements.

- Inappropriate "bulleting" of alternative actions where only one action is required (Bullets normally applied to steps that require multiple substeps, but for which sequence of performance is not important).

- Lack of consistency in providing component identification information.

- Inappropriate use of the phrase "as necessary" to direct operator actions in lieu of specifying the requisite conditions for performance.

- Presentation of step-dependent cautions and notes within the Operator Action Summary page which is normally reserved for contingent actions that are applicable throughout the procedure.

- Negative wording in steps associated with checking steam generator pressure which can lead to operator miscommunications.

The majority of the inconsistencies noted above are attributable to either a lack of direction within the Writers Guide or a failure to consistently apply those directions that do exist. Because of the importance of maintaining consistency within the EOPs, which, in essence, is accomplished via the Writers Guide, the licensee has agreed to review the Writers Guide and strengthen those areas where additional guidance is warranted. The above identified weaknesses will be tracked as Item No. 443/90-84-01.

3.4 CONCLUSIONS:

The Team determined that the EOPs generally follow the recommended ERG step sequence except where site specific design dictates otherwise Entry, exit and procedural transition points are correct and can be followed. The EOPs are technically adequate and incorporate the guidance

and intent of the Westinghouse Emergency Response Guidelines. From a human factors standpoint, the inspection team found the EOPs to be generally well written; however, there was a lack of consistency between EOPs. This lack of consistency was determined to be a result of vague directions contained in the Writers Guide. The licensee has agreed to review and strengthen the Writers Guide and subsequently apply those changes to the EOPs.

No violations or deviations were identified with respect to this functional area.

## 4.0 REVIEW OF THE EMERGENCY PROCEDURES BY CONTROL ROOM AND PLANT WALKDOWMS

### 4.1 PURPOSE:

To assure that the emergency operating procedures (EOPs) and abnormal operating procedures (AOPs) can be successfully accomplished using the installed equipment, instrumentation and controls.

### 4.2 SCOPE:

Licensed and non-licensed operators were used to walkdown the Emergency Operating and Abnormal Operating procedures listed in Attachment 1. The walkdowns were conducted either on the simulator, in the control room or in the plant to ensure that: (1) actions required by the procedure could be accomplished using the installed equipment, instrumentation and controls; and (2) procedural guidance was clear enough that operator confusion and error can be avoided.

Except as detailed in 4.3 below, the procedures inspected were generally clear and provided sufficient detail for the operator to complete the required actions.

### 4.3 FINDINGS:

#### A. LABELS

During the review and control room walkdowns of the Emergency Operating procedures, the inspectors found the present labeling to be adequate, but subject to improvement. The licensee stated that the present system could use enhancement to aid auxiliary operators, e.g., larger labels in areas where there may be an adverse environment. Labeling upgrade has been assigned to an engineer; but, to date, no action has been initiated since a decision on what to do has not been made. The licensee is evaluating various recommendations as to what information should be included on a label; how large should it be, etc. The NRC stated that if the licensee was seriously committed to the label upgrade program, then a decision should be made as to what is considered to be appropriate for meeting their operational objectives. Implementation of the labeling upgrade

should commence shortly thereafter. The licensee acknowledged the NRC's comments and agreed that a decision would be made. Deficiencies considered to be generic weaknesses are listed below:

- Some labels are located on a non-visible side or are located in a difficult to read location.

- Four different formats are used within the EOP network when designating valves:

  1) common noun name - no equipment ID number
  2) common noun name - equipment ID number
  3) equipment ID number - common noun name
  4) equipment ID number - no common noun name

- Control room equipment labels were not always consistent with the nomenclature contained within the procedures. The team found no instances of operational errors (by licensed control room operations personnel) due to either nomenclature or labels. But, the potential for errors does exist. The following are examples of the differences between Control Room labels and noun names in FR-I.1.

| Noun Name | Control Room Label |
|---|---|
| Letdown HX cooling water outlet | PCCW ISO From LTDN HX |
| Letdown line Phase A isolation valves | LTDN HX IRC ISO |
| Letdown line isolation valves | LTDN REGEN HX ISO |
| RCP seal return header Phase A isolation valves | RCP Seals to Seal WTR HX |

B. COMMUNICATIONS

Communications outside the control room are via the paging system, telephones, sound powered phones or portable radios. Auxiliary operators are required to carry portable radios at all times. A contracted review, initiated by the licensee and completed in June 1990, did not reveal any "dead spots" under conditions of ECA-0.0, Loss of All AC Power. Members of the Security Department also regularly use portable radios on their rounds and are required to report any "dead spots."

C. EMERGENCY LIGHTING

Both the inspection team and the licensee's contracted review determined that there were some areas in the plant where installed emergency lighting was not adequate. The licensee's immediate solution to this problem was extensive use of portable lighting. There are four locations where twelve battery operated lanterns are located and are on constant charge. Also, temporary Deficiency Report (TDR) - 251 has been issued to ensure that all auxiliary operators have been trained in the use of portable lighting, with all training to be completed by December 1990.

D. ACCESSIBILITY

The inspection team verified that an evaluation of areas needing platforms to ensure accessibility to locations or components pertinent to the EOPs had been performed. In all, seven locations had been identified as needing platforms and are as follows:

- ASDV access area
- MS-V-393 access area
- Steam driven EFW pump local start area
- BAT room valves
- CO-V-142 access area
- CO-V-161 access area
- EFW Pump house floor

Engineering of platforms is nearing completion and construction is scheduled to start by March 1991. In the interim, dedicated ladders have been put in place for access to the above mentioned areas.

E. TRIPPING AND BUMPING HAZARDS

Tripping and bumping hazards, specific to locations/components within the EOPs, have been identified by the licensee. Many of these hazards have been marked by yellow and black tape or, in the case of head bumping hazards, covered with foam material. The inspection team also identified other areas within the plant, not necessarily specific to the EOPs, where such hazards exist. The licensee acknowledged the team's comment and stated that a higher priority should be given to the identification and subsequent correction of other area hazards.

4.4 CONCLUSIONS:

The inspection team determined that the EOPs could be successfully accomplished using the installed equipment, instrumentation and controls. The team also determined that successful performance of local manual operations was possible.

No violations or deviations were identified with respect to this functional area.

## 5.0 SIMULATOR OBSERVATION (TASK-4)

### 5.1 PURPOSE:

To assure that the emergency operating procedures (EOP) can be correctly implemented during emergency conditions, to further evaluate concerns about EOP usability, and to assure that EOP training provides the operators with the necessary background.

### 5.2 SCOPE:

Utilizing the plant referenced simulator, the team assessed the adequacy of the training on the EOPs by observing the actions of two crews of licensed operators during unrehearsed senarios designed to evaluate crew familiarity with and the ability to use the EOPs. The scenarios were developed with the intent of providing the Team the opportunity to:

A. Observe the crew's performance to validate or resolve concerns resulting from review of the EOPs or AOPs.

B. Assess the licensee's operating philosophy with respect to the EOPs and AOPs, especially where initial reviews identified differences from the ERGs.

C. Assess the human factors elements associated with the performance in a real time situation.

D. Assess the operating crew's diagnosis of accident conditions and transitions from one EOP to another EOP or AOP.

The scenarios consisted of the following (information enclosed in parenthesis identifies expected procedure usage).

1) The "A" PORV, is unavailable. Loss of main feedwater occurs with a failure of the reactor to trip. Loss of all emergency feedwater. "B" PORV fails to open when required. Recover the plant with feed from the condensate system (FR-S.1, E-0, FR-H.1).

2) The "A" Residual Heat Removal pump is unavailable. A loss of loop "B" Primary Component Cooling Water occurs. When the reactor is tripped, a design basis LOCA occurs. Offsite power is lost; "B" RHR pump will not restart when emergency busses reenergize (OS1212.01, E-0, FR-Z.1, E-1, ES-1.3, ECA-1.1).

3) A spurious load rejection initiates from 100% power. The "A" Main Feedwater Regulating Valve fails full open. Two control

rods fail to insert when the reactor trips. The "B" Steam Generator ruptures and the Main Steam Isolation Valves fail open. One Safety Injection pump fails to start (E-0, ES-0.1, E-2, ECA-2.1).

4) A loss of 4kv bus 3 causes a reactor trip. Offsite power is lost and the "A" Emergency Diesel fails to start. "B" Emergency Diesel trips due to a lube oil leak and fire, resulting in a loss of all AC power. "D" Reactor Coolant pump seals #1 and #2 fail. A Safety Injection signal actuates during the power outage. "A" diesel is repaired and the appropriate recovery procedure determined (E-0, ES-0.1, ECA-0.0, ECA-0.2).

5) One Main Feed pump trips causing automatic turbine setback. The Rod Control system fails to insert control rods. When the reactor is tripped, a Pressurizer Safety Valve fails open (E-0, E-1, ES-1.2).

6) The "A" PORV is unavailable. A complete loss of Instrument Air occurs. When the reactor is tripped, both Containment Air Compressors trip. The Main Turbine fails to automatically trip. A 1000 GPM Steam Generator Tube Rupture occurs. "B" PORV fails to open when required (ON1242.01, E-0, E-3, ECA-3.3).

5.3 FINDINGS

Both crews observed were able to use the EOP network and other plant procedures to mitigate complex failures. Both crews also displayed adequate overall communications; however, there was a noticeable difference between the crews in the use of order repeatbacks.

One error was observed in the first scenario described in 5.2. In this scenario, the crew was performing FR-S.1, "Response to Nuclear Power Generation/ATWS" when a Reactor Operator reported that Reactor Coolant Pump trip criteria of the Operator Actions Summary (OAS) page for E-0 "Reactor Trip or Safety Injection" were met. The Unit Shift Supervisor was unsure whether these criteria were applicable in FR-S.1 and thought the blank OAS page may have been a reproduction error. This procedure (FR-S.1) has no OAS and the decision to trip RCPs was incorrect.

An additional problem, which also dealt with the OAS page, is that Caution(s) is(are) listed on all OAS pages in the procedure, but is(are) not applicable until a certain procedural step(s) is(are) taken. However, it was noted in several instances that the Unit Shift Supervisor read aloud a caution from the OAS page and then did not reread it when it appeared in the body of the procedure at the applicable step.

The licensee acknowledged these problems concerning the use of the Operator Action Summary pages and agreed to resolve the issues identified. Corrective actions will be tracked as Item No. 443/90-84-02.

5.4 CONCLUSIONS:

Based on the observations of the operating crews during the simulator exercises, the team determined that the EOPs and AOPs can be implemented during an emergency. The team also determined that the Seabrook EOPs have adequate usability, and training in EOP implementation has been effective.

No violations or deviations were identified with respect to this functional area.

6.0 ON-GOING EVALUATION OF THE EMERGENCY PROCEDURES

6.1 PURPOSE:

Determine if the licensee has established a long term evaluation program for the emergency procedures as recommended in Section 6.2.3 of NUREG-0899.

6.2 SCOPE:

Performance of this task entailed a review of the administrative programs, procedures, and activities related to the evaluation and maintenance of EOPs at the Seabrook Plant. Specifically, this review examined the adequacy of:

A. The EOP change and revision process.

B. Verification and validation activities.

C. The EOP Writer's Guide.

D. Involvement of independent quality assurance organizations in the evaluation process.

6.3 FINDINGS:

A. The EOP change and revision process is described in OP 9.9, "Emergency Operating Procedure Maintenance." This procedure describes the process for plant personnel to submit proposed changes to the EOPs (i.e. use of the EOP Step Change Request Form) and the requirements for comment review and resolution. The process includes a mechanism for providing feedback to the person requesting the change; however, one weakness identified is the lack of provision for informing the requestor of the final comment disposition.

The EOP maintenance program is also supported by the Station Operation Review Committee (SORC) process. This process ensures that all proposed design modifications are reviewed and approved by representatives of various plant organizations. Routing of proposed modifications through the operations group SORC representative ensures that any EOP-affecting changes are identified.

The team also noted the licensee's ability to implement changes to the EOPs in a timely manner. The licensee's utilization of an automated procedure maintenance system appears to expedite the revision process and eliminate the need for making temporary changes to the EOPs. Evidence was provided demonstrating that changes can be implemented within two days of comment receipt.

B. Requirements for EOP verification and validation are described in OP 9.9 and OP 9.8. These procedures stipulate the requirements for determining the type of validation to be performed, the processes for performing the validation, and the validation criteria to be applied. Areas where weaknesses were noted include the need to expand the list of criteria for walkdown validations and the lack of requirements for inclusion of human factors personnel on the V&V teams. As part of the recent EOP upgrade effort, the licensee completed control room validations of the new procedures as well as in-plant walkdowns of local actions. The lack of significant findings during the inspection team's walkdowns supports the effectiveness of the licensee's V&V program.

C. Guidance for the development and revision of EOPs is provided in OP 9.1, "Emergency Operating Procedures Writers Guide." Revision 2 of this document has recently been issued and has not yet been implemented in the EOP revision process. In general, the current version appears to provide adequate direction for procedure development and revision, and is consistent with accepted human factors principals and guidance provided in NUREG-0899. There are a few areas however where additional guidance and detail should be provided to ensure consistency in the EOPs over time. Specific comments regarding the writers guide are provided in Attachment 2.

D. Periodic evaluations of the EOPs by an independent organization has been conducted by the onsite Quality Control group. These evaluations have been conducted as part of their regular surveillance program and as such are categorized as surveillances. Several completed EOP surveillances were reviewed by the inspection team, including responses to any findings. It was determined that an adequate review of the EOPs, including EOP changes and subsequent validation of these changes, was being performed.

The Quality Assurance Department is currently developing a plan for performing periodic audits of the EOPs. These periodic audits would focus primarily on a programmatic review of the EOP program.

6.4 CONCLUSIONS:

The team determined that overall, the licensee's program for ongoing evaluation and maintenance of the EOPs was adequate and consistent with guidance provided in NUREG-0899. Weaknesses that were identified were discussed with the licensee as areas of potential improvement.

No violations or deviations were identified with respect to this functional area.

## 7.0 EOP USER INTERVIEWS

### 7.1 PURPOSE:

To augment and clarify findings from other inspection tasks through interviews with procedure users, developers, trainers, and other appropriate plant staff.

### 7.2 SCOPE:

Operators (ROs and SROs) were interviewed to determine their understanding of the EOPs and their responsibilties in executing the procedures as members of the control room team. Additionally, operator opinions were solicited regarding adequacy of training on the EOPs, opportunities for operator input in revising the EOPs, and overall satisfaction with the technical accuracy and useability of the procedures. Interviews were also conducted with non-licensed operations staff regarding their roles in supporting the implementation of the EOPs, and with EOP developers regarding procedure development, revision and verification and validation (V&V) activities.

### 7.3 FINDINGS:

In general, licensed operators demonstrated a good understanding of the EOPs and expressed no significant concerns regarding the accuracy or usability of the procedures. Most operators stated that their training on the EOPs was very good. There was some concern expressed regarding recent reductions in the amount of simulator time that was made availabe during requalification training. Operators expressed satisfaction with opportunities for providing input to the EOP revision process and stated that their comments were given fair consideration.

One area of concern, addressed also in paragraph 5.3, that was confirmed during interviews with the operators is the lack of standardization regarding use of the Operator Action Summary (OAS) pages in the procedures. Operators reported that once cautions and notes are read aloud from the OAS, it is optional whether or not to read the statement again when it appears in the procedure. This practice does not ensure that caution and notes are read at the most applicable time during the procedure and leaves open the possibility that they may go unheeded. Most operators interviewed expressed a desire for eliminating any step-dependent cautions and notes from the OAS.

### 7.4 CONCLUSIONS:

Overall, interviews with the EOP users corroborated the findings of the inspection team as described elsewhere in this report. Interviews confirmed that the operators have confidence in the technical accuracy and

useability of the EOPs. In general, licensed operators demonstrated a good understanding of the EOPs and expressed no significant concerns regarding the accuracy or usability of the procedures.

No violations or deviations were identified as a result of this functional area.

## 8.0 LICENSEE ACTION IN RESPONSE TO PREVIOUS INSPECTION FINDINGS

(Closed) Open Item (443/89-11-01): Licensee's policy on procedural adherence should be reviewed to ensure that clear guidance is provided for appropriate operator actions concerning equipment failures during the use of EOPs.

The scenarios run during the EOP inspection included various equipment failures for which corrective action was not explicitly addressed in the EOPs. Based upon the operator response to these failures during the scenarios observed by the NRC, it was determined that the licensee had adequately trained licensed operators as to the proper response to equipment failures occurring during the use of EOPs. This item is closed.

## 9.0 MANAGEMENT MEETINGS

### 9.1 WORKING MEETING (September 21, 1990)

The details of the inspection findings were discussed with facility management at the working meeting. The purpose of the working meeting was:

(1) To ensure that the facility understood all of the findings.

(2) To give the facility a chance to refute the findings, as appropriate.

(3) To obtain commitments, if necessary, from the facility with respect to correction of the valid findings.

### 9.2 EXIT MEETING, SEPTEMBER 21, 1990)

The major inspection findings were presented, and the remainder of the findings were summarized to all personnel present at the exit meeting. Personnel present are listed in Paragraph 10 of this report.

## 10. PERSONNEL CONTACTED:

PUBLIC SERVICE OF NEW HAMPSHIRE

J. Cady, Independent Safety Evaluation Group Supervisor
L. Carlsen, Operations Training Supervisor
R. Connolly, Lead Technical Quality Control Inspector
D. Covill, Nuclear Quality Surveillance Supervisor

10. PERSONNEL CONTACTED (Cont'd.):

PUBLIC SERVICE OF NEW HAMPSHIRE (Cont'd.)

B. Drawbridge, Executive Director of Nuclear Production
J. Grillo, Operations Manager
R. Hanley, Operations Training Manager
T. Harpster, Director, Licensing Services
S. Kirchhoff, Emergency Operating Procedures (EOP) Coordinator
R. Krohn, NRC Coordinator
J. Malone, Operations Administrative Supervisor
D. Moody, Station Manager
J. Peschel, Regulatory Compliance Manager
J. Peterson, Assistant Operations Manager
W. Temple, Regulatory Compliance Engineer
P. Richardson, NHY Training Manager
E. Spador, Operations EOP Assistant

NUCLEAR REGULATORY COMMISSION (NRC)

J. Arildsen, NRC Headquarters EOP Inspection Program Coordinator
P. Bissett, Senior Operations Engineer/Examiner
J. D'Antonio, Operations Engineer/Examiner
N. Dudley, Senior Resident Inspector, Seabrook
R. Furmeister, Resident Inspector, Seabrook
D. Moy, Reactor Engineer

NRC CONTRACTORS

M. McWilliams, Human Factors Specialist, SAIC
J. Sears, System Engineer, COMEX Corporation

ATTACHMENT 1

DOCUMENTS REVIEWED

| Document Number | Document Title | REV |
|---|---|---|
| WESTINGHOUSE OWNERS GROUP (WOG): | | |
| --- | WOG Emergency Response Guidelines | 1A |
| EMERGENCY OPERATING PROCEDURES | | |
| E-0 | REACTOR TRIP OR SAFETY INJECTION | 11 |
| ES-0.0 | REDIAGNOSIS | 07 |
| ES-0.1 | REACTOR TRIP RESPONSE | 09 |
| ES-0.2 | NATURAL CIRCULATION COOLDOWN | 08 |
| ES-0.3 | NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL (WITH RVLIS) | 08 |
| ES-0.4 | NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL(WITHOUT RVLIS) | 08 |
| E-1 | LOSS OF REACTOR OR SECONDARY COOLANT | 10 |
| ES-1.1 | SI TERMINATION | 10 |
| ES-1.2 | POST-LOCA COOLDOWN AND DEPRESSURIZATION | 10 |
| ES-1.3 | TRANSFER TO COLD LEG RECIRCULATION | 09 |
| ES-1.4 | TRANSFER TO HOT LEG RECIRCULATION | 08 |
| E-2 | FAULTED STEAM GENERATOR ISOLATION | 08 |
| E-3 | STEAM GENERATOR TUBE RUPTURE | 10 |
| ES-3.1 | POST-SGTR COOLDOWN USING BACKFILL | 07 |
| ES-3.2 | POST-SGTR COOLDOWN USING BLOWDOWN | 07 |
| ES-3.3 | POST-SGTR COOLDOWN USING STEAM DUMP | 09 |
| ECA-0.0 | LOSS OF ALL AC POWER | 11 |
| ECA-0.1 | LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED | 09 |
| ECA-0.2 | LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED | 08 |
| ECA-1.1 | LOSS OF EMERGENCY COOLANT RECIRCULATION(ECR) | 10 |
| ECA-1.2 | LOCA OUTSIDE CONTAINMENT | 09 |
| ECA-2.1 | UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS | 09 |
| ECA-3.1 | SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED | 10 |
| ECA-3.2 | SGTR WITH LOSS OF REACTOR COOLANT - SATURATED RECOVERY DESIRED | 09 |
| ECA-3.3 | SGTR WITHOUT PRESSURIZER PRESSURE CONTROL | 08 |
| FR-S.1 | RESPONSE TO NUCLEAR POWER GENERATION/ATWS | 09 |
| FR-S.2 | RESPONSE TO LOSS OF CORE SHUTDOWN | 07 |
| FR-C.1 | RESPONSE TO INADEQUATE CORE COOLING | 09 |
| FR-C.2 | RESPONSE TO DEGRADED CORE COOLING | 09 |
| FR-C.3 | RESPONSE TO SATURATED CORE COOLING | 08 |
| FR-H.1 | RESPONSE TO LOSS OF SECONDARY HEAT SINK | 09 |

| Document Number | Document Title | REV |
|---|---|---|
| WESTINGHOUSE OWNERS GROUP (WOG): | | |
| --- | WOG Emergency Response Guidelines | 1A |
| EMERGENCY OPERATING PROCEDURES | | |
| FR-H.2 | RESPONSE TO STEAM GENERATOR OVERPRESSURE | 07 |
| FR-H.3 | RESPONSE TO STEAM GENERATOR HIGH LEVEL | 07 |
| FR-H.4 | RESPONSE TO LOSS OF NORMAL STEAM DUMP CAPABILITIES | 07 |
| FR-H.5 | RESPONSE TO STEAM GENERATOR LOW LEVEL | 07 |
| FR-P.1 | RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITIONS | 09 |
| FR-P.2 | RESPONSE TO ANTICIPATED PRESSURIZED THERMAL SHOCK CONDITION | 07 |
| FR-Z.1 | RESPONSE TO HIGH CONTAINMENT PRESSURE | 08 |
| FR-Z.2 | RESPONSE TO CONTAINMENT FLOODING | 07 |
| FR-Z.3 | RESPONSE TO HIGH CONTAINMENT RADIATION | 07 |
| FR-I.1 | RESPONSE TO HIGH PRESSURIZER LEVEL | 07 |
| FR-I.2 | RESPONSE TO LOW PRESSURIZER LEVEL | 07 |
| FR-I.3 | RESPONSE TO VOIDS IN REACTOR VESSEL | 08 |
| CRITICAL SAFETY FUNCTION STATUS TREES (CSFST): | | |
| F-0.1 | SUBCRITICALITY CSFST | 08 |
| F-0.2 | CORE COOLING CSFST | 07 |
| F-0.3 | HEAT SINK CSFST | 08 |
| F-0.4 | INTEGRITY CSFST | 08 |
| F-0.5 | CONTAINMENT CSFST | 08 |
| F-0.6 | INVENTORY CSFST | 07 |
| F-0.7 | EMERGENCY RECIRCULATION CSFST | 08 |
| F-0.8 | RDMS CSFST | 08 |
| EOP REFERENCED PROCEDURES | | |
| OS 1013.03 | RHR STARTUP AND OPERATIONS - TRAIN A | |
| OS 1013.04 | RHR STARTUP AND OPERATIONS - TRAIN B | |
| OS 1035.02 | STARTUP FEEDPUMP OPERATIONS | |
| OS 1023.40 | H2 RECOMBINER OPERATIONS | |
| OS 1023.71 | H2 ANALYZER OPERATIONS | |
| OS 1213.01 | LOSS OF RHR DURING SHUTDOWN COOLING | |
| ON 1042.04 | SERVICE AIR COMPRESSOR | |
| OP 1023.69 | CONTAINMENT ON LINE PURGE VALVE ISOLATION | |

ATTACHMENT 2

DEFICIENCIES IDENTIFIED

A. GENERAL FINDINGS APPLICABLE TO VARIOUS EOPs:

1. The EOPs reference other procedures, including certain Operating Procedures. In some cases, the referenced procedure is a long complex document. That makes location of the desired entry point in the referenced procedure somewhat difficult. In other cases, a seldom performed action or RNO has no procedure reference. The licensee recognizes this deficiency and intends to correct it in the next revision of the EOPs.

2. There is a lack of consistency in incorporating the alphanumeric designation of equipment into procedures.

3. There is a lack of consistency in specifying radiation monitors for detecting radiation in the secondary system.

4. There is a lack of consistency in specifying locations of infrequently operated equipment.

B. GENERAL FINDINGS APPLICABLE TO THE WRITERS GUIDE:

1. Use of Logic Terms (Section 4.3.2.3) - Because of the high potential or misuse of logic terms, the Writer's Guide should give examples of misuse and caution against bolding AND/OR when used as simple conjunctions or using them together in the same sentence. Also, spacing is sometimes used in the procedures to highlight conditional phrases. Use of spacing, however, is not discussed to ensure consistency.

2. Transitions to Other EOPs or Steps (Section 4.3.2.5) - The Writer's Guide states that "transitions to a step which is preceded by a CAUTION or NOTE may include special wording to assure that the CAUTION or NOTE is observed. This is not consistently done in the procedures. It is more likely that a CAUTION or NOTE will be overlooked during a transition, however, the writer's guide does not make this a clear requirement.

3. Procedures Outside the EOP Set (Section 4.3.2.6) - To avoid delays or confusion regarding the use of non-EOPs, guidance does not require identification of the specific steps or sections to be performed by the operator. Also, alternatives to referencing outside procedures are not always evaluated, such as incorporating applicable steps from outside procedures into the EOPs or EOP attachments.

4. Component Identification (Section 4.3.2.7) - This section does not provide guidance on the use of component identification numbers. Guidance does not specify when components are to be identified by number and the format that is to be used. Although use of component identification numbers is mentioned (inappropriately) in the section on Abbreviations and Acronyms, there is no guidance as to when numbers are to be used.

5. Level of Detail (Section 4.3.2.8) - This section cautions the writer against use of excessive detail and directs him not to include information which the operator is required to know. This caution does not take into consideration the knowledge level of the "newly qualified" operator as well as the potential for performance degradation which occurs under stressful conditions. Also, discussion of action verbs is not appropriate for this section.

6. Vocabulary (Section 4.7.4) - The writer's guide refers to a list of frequently used verbs, but it is unclear as to the requirements for selecting verbs from this list.

7. Adverse Containment - In many instances in the procedures, alternative parameter values are provided for adverse containment conditions. The writer's guide does not address when use of adverse containment values are appropriate nor does it provide a standard method for indicating these values.

8. Equipment Location - When operation of infrequently used or difficult to find equipment is required by the EOPs (especially in performing local operations), equipment location should be provided. Inclusion of this type of information should be discussed in the Writer's Guide.

C. FINDINGS APPLICABLE TO SPECIFIC EOPs:

E-0 REACTOR TRIP OR SAFETY INJECTION

1. Step 7.b (RNO)

Operator is directed to open one steam drain path OR reset trip valve as necessary. This is not a case of equally acceptable alternatives as "OR" would indicate. Rather it is conditional on the position of the trip valve. Also, there is a procedure for resetting the trip valve that is not referenced (OS 1090.01, Section 6.8).

2. Step 13.a

Step requires operator to check SG pressure rate bistable trip light - LIT. Step should require at least 2 lights - LIT (2 out of 3 logic).

3. Step 13.b

Step directs operator to verify MSIVs, MSIV bypasses and MSIV upstream drains - Closed. Best indication for MSIV upstream drains is on opposite side of control room, necessitating primary operator to help perform this step. Subdivide this step to better reflect division of duties.

4. Step 14.a.3 (RNO)

Valve names referenced in procedure do not match names on labels.

5. Step 15.b (RNO)

Warn operator to observe caution in transition to Step 16.

6. Step 15.e (RNO)

Step directs operator to manually start pumps and check valve alignment. Valve alignment should be checked first.

7. Step 15.a (RNO)

In response to no CCP flow, operator is directed to "manually start pumps and align valves." Operator was not sure if this entailed entire cold leg injection lineup or only enough to get flow (CCPs running and suction path).

8. Step 16

Step directs operator to verify total EFW flow greater than 500 gpm total flow to at least two steam generators. In similiar steps, and in RNO column for this step, the two SG criteria is deleted.

9. Step 17 (RNO)

"DO NOT" incorrectly highlighted as logic terms.

10. Step 20.b (RNO)

The word "and" is not highlighted as a logic term combining conditions for pressurizer pressure less than 2385 psig AND (less than) setpoint per Figure E-0-1. For clarification, phrase "less than."

11. Step 22

Negative wording in substeps for checking steam generator pressure presents opportunity for miscommunication.

12. Step 34

Caution preceding step 34 warns operator against exceeding the capacity of the power source when loading AC emergency bus. List of equipment loads not readibly available in the control room.

13. Step 34 (RNO)

Does not provide the Node numbers for the supply breakers to be cycled (D93 and D95).

14. Step 36.a.2 (RNO)

Operator is directed to place all 13.8KV and 4.16 KV loads on busses 1, 2, 3, and 4 in PULL to LOCK. A listing of loads are not provided as an attachment.

E-1 LOSS OF REACTOR OR SECONDARY COOLANT

1. Step 1

Operator is directed to check that at least one ECCS pump is running, followed by substep alternative "CCPs or SI pumps." To be consistent with the high level step requiring only one running, the substep alternatives are to be singular (CCP or SI pump).

2. Negative wording in substeps for checking steam generator pressure present opportunity for miscommunication.

3. Step 8.e

Operator is directed to start as many containment cooling fans as possible. This wording ensures that the condition will always be attained (even if no fans start), thus preventing the operator from referring to the RNO column for directions on reseting EPS-RMO.

4. Step 11.c

Specify "unloaded" emergency diesel generators.

5. Step 15.a (RNO)

Operator is directed to return to this step when RCS temperature is less than 370 degrees F. and perform steps 15 b and c. This instruction should also include substep d.

6. Step 15.c (RNO)

Specify procedure and applicable steps.

7. Step 16

   Operator is directed to "reestablish instrument air supplies while continuing with this procedure." Direction to "continue with this procedure" is not needed as general useage of procedures provides for this.

8. Step 16.a (RNO)

   THEN is incorrectly highlighted as a logic term.

9. Step 16.c (RNO)

   "AND" is incorrectly highlighted as a logic term.

10. Step 18.a

    Operator is directed to consult plant TSC to determine if reactor vessel head should be vented. Guidance is not provided to the operator regarding this decision in the event that the TSC is not yet staffed.

11. Step 19.b.1

    "AND" is incorrectly highlighted as a logic term.

ES-0.1 REACTOR TRIP RESPONSE

1. Step 7.d.1 (RNO)

   Reference OP 1042.04 for aligning fire water to air compressors.

2. Step 7.e.2 (RNO)

   Include in the step or per attachment a listing of applicable loads.

ES-0.2 NATURAL CIRCULATION COOLDOWN

1. Step 14

   States "PZR Level - No unexpected large variations." Operators had difficulty in describing what the language meant.

2. Step 2

   Reference procedures RN 1735 and OS 1008.01.

3. Step 15.a

   Verify SI accumulator valves breaker position closed to ensure that operation of valves is possible.

ES-0.3 Natural Circulation Cooldown with Steam Void in Vessel (with RVLIS)

1. Step 6.a

   Verify SI accumulator valves breaker position closed to ensure that operation of valves is possible.

E-3 STEAM GENERATOR TUBE RUPTURE

1. Step 1.a

   Operator is directed to check at least one ECCS pump running. By listing CCPs and SI pumps (in plural form) in the substeps, this implies that both trains of CCP or SI may be necessary to meet this condition.

2. Step 3.e.2 (RNO)

   Operator is directed to close isolation valve from ruptured steam generator. Location of valves should be provided as operators indicated they are not commonly known.

3. Step 6

   Negative wording in step directing operators to check SG pressures may lead to communication problems and evaluation for possible rewording is warranted.

4. Step 5 ↄ (RNO)

   The word "and" following 2385 PSIG should be highlighted as a logic term. For this step, the three logic conditions are to be separated.

5. Step 10.a (RNO)

   The word THEN is incorrectly highlighted as a logic term.

6. Step 3.c (RNO)

   Valve labeling listed in step does not match control board labels.

7. Step 22

   Valve labeling listed in step does not match control board labels.

8. Step 29.a and 29.b

   Valve labeling listed in steps do not match control board labels.

ECA-0.0 LOSS OF ALL AC POWER

1. Note 1N4

   Reword to ensure Auxiliary Operators obtain portable lights.

2. Step 4

   Add valve numbers for TDAFW pump steam supply valves and EFW flow control valves.

3. Step 5.e and RNO

   Clarify whether the check is for loading actuated or loading complete. Consider providing an attachment specifying blackout loads which should be started, or labeling the step lights on the diesel panels with the specific loads and whether they are blackout or SI loads.

4. Caution 6C1

   Evaluate the inclusion of this caution to the Operator Action Summaries.

5. Step 7.d

   The YAEC coping study, page 10, states that tne RAT is the preferred offsite source, with the UAT acceptable. Consider stating this preference in this step.

6. Step 8

   Indicate which valve goes with which pump.

7. Step 10 RNO

   Provide a reference to OP1090.01 for local MSIV operation. Alternately, place an operator aid placard on the valves.

8. Step 14

   Clarify wording so that it is clear that the intent is for the operator to shed all Attachment B loads. As presently worded, the operator may perceive a need to evaluate the attachment and shed selected loads thus wasting time and battery life.

9. Step 17 and RNO

   There is no instrument labelled "Gammametrics" in the control room. Add the appropriate identifier. Also, specify an endpoint for the heatup in the RNO.

10. Step 23 RNO

An EOP should not specify filling the spent fuel pit to 23' until after the initial fill.

11. Attachment A:

Step 3 should be same as step 6a & b; valves are FW346/347, not MS.

12. Attachment B:

- Use full identifiers when specifying panels.
- Use the same words when describing identical locations; i.e. the words "A essential switchgear east wall" and "control bldg 21' N.E. corner" are used to describe the locations of two panels located about 3 feet apart.
- Be consistent as to whether or not amp ratings are specified.
- Operator preference is to use "A essential switchgear room" or "essential switchgear room to describe locations vice "control bldg elev 21'."

ECA-0.2 LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED

1. Caution 8C2

Specify how to monitor seal injection temperature.

2. Step 8.b

Specify which valves are for which RCP.

3. Step 8.b.3

The caution applicable to this step is on the preceeding page and may be forgotten. Reword step to incorporate the caution, or remind operator of the caution.

An operator stated that the RCP seal injection isolation and throttle valves were located in a radio dead area, with no convenient phone or page. If this is correct, add a note to this step to inform the USS of the need for a sound powered phone headset or second man to assist in communications.

ECA-2.1 UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS

1. Step 25 b.4.

Valve labeling in step does not match control board labeling.

2. Step 10.c (RNO)

Applicable procedure and/or steps are not listed.

ECA-3.1 SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED

1. Step 11

Deviation document addressess step 12.

FR-H.1 RESPONSE TO LOSS OF SECONDARY HEAT SINK

1. Step 20.c (RNO)

Applicable procedure and/or actions are not listed for aligning fire water cooling to the SACs.

FR-H.2 RESPONSE TO STEAM GENERATOR OVERPRESSURE

1. Step 4 and 8

Both of these steps require the same operator action; however, both steps are written differently, i.e., step 8 has an additional operator action that is not listed in step 4; steam supply valves for the EFW pump are listed in step 4 but are not in step 8.

FR-H.3 RESPONSE TO STEAM GENERATOR HIGH LEVEL

1. Step 8

Operator actions or applicable procedure are not listed.

FR-I.1 RESPONSE TO HIGH PRESSURIZER LEVEL

1. Step 1

Operator is directed to check SI pumps - ALL STOPPED. During the walkdown, operator was unsure whether this was to include CCPs and RHR pumps. Term "ALL" rather than listing SI pump A and B leads to confusion.

2. Step 2.a.1 (RNO)

PCCW valves are not identified by number as in other steps of other EOPs, i.e., E-0, step 34.f.

3. Step 2.b

During walkdown, operator was not sure why containment air compressor was necessary. Step should state "at least one running" and provide

equipment identification to be consistent with other steps of other EOPs, i.e., E-0, step 34.f.

4. Step 2.c (RNO)

Be more specific, rather than stating "as necessary."

5. Step 2.c, 3, and 8.b (RNO)

Instructions are provided for establishing excess letdown. There is a specific procedure (OS 1002.03) for this that should be referenced, as several cautions/notes/steps are deleted in abbreviated EOP instructions. This would also eliminate having to provide the same instructions three times in the same EOP.

6. Step 2.c and 3 (RNO)

Valve names referenced in procedure do not match names on labels.

7. Step 2.c (RNO)

Four different formats are utilized in designating valves.

FR-I.3 RESPONSE TO VOIDS IN REACTOR VESSEL

1. Step 2.c (RNO)

Valve labeling in step does not match control board labeling.

OS1023.40 HYDROGEN RECOMBINER OPERATION

1. Step 6.2.4.1

The containment pressure instruments specified in this step are not marked with orange labels; the instruments adjacent to them are. Verify the appropriate instruments for post accident conditions are used.

2. Step 6.2.8

Step does not provide directions on how to read the temperatures the operator needs to record.

3. Step 6.2.15

Typo - "second recombiner" vice "record recombiner."

equipment identification to be consistent with other steps of other EOPs, i.e., E-0, step 34.f.

4. Step 2.c (RNO)

Be more specific, rather than stating "as necessary."

5. Step 2.c, 3, and 8.b (RNO)

Instructions are provided for establishing excess letdown. There is a specific procedure (OS 1002.03) for this that should be referenced, as several cautions/notes/steps are deleted in abbreviated EOP instructions. This would also eliminate having to provide the same instructions three times in the same EOP.

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Valve labeling in step does not match control board labeling.

OS1023.40 HYDROGEN RECOMBINER OPERATION

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The containment pressure instruments specified in this step are not marked with orange labels; the instruments adjacent to them are. Verify the appropriate instruments for post accident conditions are used.

2. Step 6.2.8

Step does not provide directions on how to read the temperatures the operator needs to record.

3. Step 6.2.15

Typo - "second recombiner" vice "record recombiner."

ATTACHMENT 3

LIST OF WEAKNESSES IDENTIFIED AS NEEDING CORRECTION

| Item No. | Para. No. | Description |
|---|---|---|
| 90-84-01 | 3.3.g | Review Writer's Guide and strengthen those areas in which direction is vague so as to provide consistency within all EOPs. |
| 90-84-02 | 5.3 | Correct weaknesses associated with the Operator Action Summary page. |